Remarks
submitted October 2007

[001] This is in response to the Office Action dated 10 May 2007.

[002] Amendments

In the disclosure: Please enter the amendments to paragraphs [0028], [0034], [0037], [0038], [0051], [0057], as attached.

In the drawings: (no amendments)

In the claims: Please enter the amendments to claims 7,31, as attached. Claim 32 is cancelled.

[003] Drawings

We have amended paragraphs [0037] and [0038], by removing the reference numeral 233. Thus, no change need be made to the drawings.

[004] Specification

The amendments address the points made in section 2 the O/A, except as follows.

The O/A states (section 2) that certain terms are so unclear, inexact, or verbose as to warrant rejection of the specification under 35.USC.112, 1st paragraph. However, we really cannot see that the person skilled in the art of designing engine cooling systems would find any problem with any of the examples mentioned in the O/A, under any of the headings *unclear, inexact*, or *verbose*. Consequently, we invite the PTO to reconsider the objections.

If the PTO were to continue this rejection, we would ask to be supplied with further particulars as to the basis for the objection, and especially to informed just which of the attributes *unclear, inexact,* or *verbose* is being alleged in respect of which of our terms.

[005] Claim Objections

The amendments correct my mistake, as indicated in the O/A.

[006] Anticipation of claim 31 by KIM

The PTO rejects claim 31 under 35.USC.102, alleging that claim 31 contains no limitations by

which claim 31 is distinguished from the KIM patent publication. We request that this be reconsidered.

As we understand the KIM disclosure, when the coolant is cold, there is no drive to KIM's large impeller 26. Therefore, in KIM, when the coolant is cold, the coolant does not circulate through the radiator (arrow 13). In KIM, when the coolant is cold, only the small impeller 27 is driven, which circulates the coolant around the engine block (arrow 12).

On the other hand, in KIM, when the coolant has warmed up, now both the large impeller and the small impeller are both driven. Therefore, the coolant now does circulate around the radiator. (Thus, the two-impeller coolant-pump system proposed by KIM might serve to ensure that the engine warms up as quickly as possible.)

Claim 31 of the present patent application, as now amended, makes it clear that the two sets of blades are located both on the same unitary impeller, whereby both sets of blades rotate in unison and only in unison.

By this amendment, examined-claim 31 is clearly distinguished from the apparatus disclosed by KIM. This takes care of the 35.USC.102 rejection.

We state, however, that we do not accept that the KIM apparatus falls within the scope of the un-amended as-examined claim 31.

For example, claim 31 requires that the thing that determines whether the coolant does or does not pass through the secondary blades is the rotational speed of the impeller -- which clearly is not the case in KIM.

Also, claim 31 requires that the blades be so shaped that coolant from the primary blades is partially deflected away from entrances of secondary blades -- which, again, is not the case in KIM.

Also, claim 31 requires a promontory, around which coolant can flow when the impeller is rotating slowly, but such flow becomes increasingly inhibited as impeller speed increases -- and we cannot see a promontory that has that effect in KIM. Clause [10] of claim 31 requires that the flow be so directed that, the faster the flow, the smaller the flow around the promontory, on its way to enter the secondary blades. The item 25 in KIM, which the O/A refers to as a promontory, does not do that.

As far as we can tell from KIM's disclosure, in KIM's two separately-rotatable impellers the liquid being pumped enters the blades radially inwards. If the PTO were to continue the rejection of claim 31 based on KIM, we would request to be informed as to just how the PTO is interpreting the flow of coolant through KIM's two impellers. (Normally, in an engine coolant pump, liquid enters the impeller along the axial centre of the impeller -- but it is not clear how this could be the case with the KIM system.)

[007] <u>Statutory prohibition against double patenting, 35.USC.101</u>

Calling the claims of granted patent US-6,887,046 the *granted-claims*, and the claims of the present patent application the *examined-claims*, the PTO alleges that granted-claims 1,3,4,5,6,7,8 are co-terminous with examined-claims 5,13,14,15,16,17,18,32.

In particular, the PTO alleges that granted-claim 1 is of the same scope as examined-claim 5.

We draw attention to clause [23] of the examined-claim 1, from which examined-claim 5 depends.

Clause [23] of examined-claim 1 recites that the set of swirl-vanes, the radiator-port, and the radiator-port-closer, are located inside the pumping-chamber. Therefore, of course, that feature is a limitation of examined-claim 5. However, that feature is NOT a limitation of granted-claim 1. Therefore, examined-claim 5 and granted-claim 1 are NOT co-extensive in scope.

Therefore, we request that the rejection of examined-claim 5 under 35.USC.101 be reconsidered and withdrawn.

In fact, none of the granted-claims 1,3-8 contain the limitation recited in clause [23] of the examined-claim 1, in which the swirl-vanes, the radiator port, and the radiator-port-closer are all located inside the pumping-chamber. Therefore, we request that the rejection of all the claims rejected under 35.USC.101 likewise be withdrawn.

[008] <u>Non-statutory double patenting</u>

The PTO alleges that examined-claims 1,8,12,20,21,25,26,27,29 are not patentably distinct over granted-claims 1,2,9,16,17,18,19.

In this case, the points made in the O/A refer to the several similarities between the examined-claim 5 and the granted claim 1, which we do not dispute. However, the O/A does not mention one of the main <u>differences</u> between the claims. Thus (again) we point out that the examined-claim 1 includes clause [23], whereby examined-claim 1 is limited to the feature that the set of swirl-vanes, the radiator port, and the rad-port-closer, are located inside the pumping-chamber. That limitation is simply not present in granted-claim 1.

That difference makes granted-claim 1 and examined-claim 1 patentably distinct. That is to say, it is our position that the two claims are patentably distinct, besides being non-co-extensive. Sub-claims dependent from two patentably-distinct parent claims must themselves be patentably distinct, also.

Therefore, we request that the rejection of all the examined-claims rejected on the basis of the non-stat double-patenting doctrine be withdrawn.

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Enclo:
amended parags [0028], [0034], [0037], [0038], [0051], [0057] (2 pages)
amended claims (10 pages)

Amended Disclosure
submitted October 2007

Please enter the amendments to paragraphs [0028], [0034], [0037], [0038], [0051], [0057], as follows.

[0028] The cooling system of which the pump of Fig 1 is a component is of the type in which coolant circulates at all times through the heater (Fig 6). (In other types of cooling system, flow may be sometimes, in operation, diverted to by-pass the heater.) In Fig 6, the impeller of the pump P is driven e.g by means of a geared drive, or by means of a belt drive 241, directly from the engine E. In Fig 6, when the coolant is warmed up, the coolant circulates around the radiator R; when the coolant is cold, coolant cannot circulate around the radiator R, because the swirl-vanes 234 in the pump P lie in a fully-closed position, thus closing off the radiator-port 237. The temperature-sensing bulb in the thermostat-unit 235 is positioned appropriately to measure the temperature of the coolant coming from the engine E (and, or via, the heater H) just before the coolant enters the pump P. As shown in [~~Fig 1~~] Fig 3, there is a passage 248 between the heater port 238 and the bulb, whereby the bulb is flooded with incoming coolant.

[0034] After that, once the coolant has warmed up, the temperature of the coolant varies in accordance with driving conditions, vehicle loading, ambient temperature, etc; as the coolant becomes hotter, or becomes less hot, the swirl-vanes vary as to their orientation, in accordance with the coolant temperature, in the manner as described in the publications. Again, the designer should arrange that, once the coolant is up to normal running temperature, the angle the swirl-vanes 234 adopt when the coolant is at its hottest gives the greatest boost to the flowrate, whereas the angle the vanes adopt when the coolant is at the cooler end of its range of normal-running temperatures gives the greatest reduction (or, it may be termed, gives the smallest boost) to the normal-running flowrate. Typically, the minimum normal-running flowrate may be of the order of a half of the maximum normal-running flowrate, at a typical pump speed and operating condition. In Fig 1 the impeller 136 rotates in [~~an anti-clockwise~~] a counter-clockwise direction, whereby the above manner of operation obtains.

[0037] It will be noted from Fig 1 that the swirl-vanes 234 (numbering thirteen swirl-vanes in this

case) do not completely surround the impeller 236. A sector of the circumference of the impeller is left open, being the sector communicating with the engine/heater inlet port 238, i.e the flow that by-passes the radiator during warm-up. Thus, even when the swirl-vanes are fully closed (Fig 4a), it is only the radiator port 237 that is blocked, not the by-pass port 238. When the coolant is cold enough for the radiator to be blocked the flowrate passing through the engine is quite small, which is reflected by the fact that this flow occupies only a small sector [~~233~~] of the circumference of the intake of the impeller. The full HOT flowrate passing through the radiator will be many times greater than the low flowrate of the by-pass flow passing through just the engine/heater in the COLD condition.

[0038] The swirl-vanes are most effective when they are arranged to completely, or almost completely, surround the intake of the impeller. If some of the flow entering the impeller has not been through the swirl-vanes, then the flowrate is not being fully and completely controlled responsively to the swirl-vanes, i.e responsively to the temperature-dependent orientation of the swirl-vanes. Preferably, the designer should see to it that as much as possible of the warmed-up flow of coolant passes through the swirl-vanes. In other words, the sector [~~233~~] of the impeller circumference that receives incoming flow from the engine, during warm-up from cold, should be minimal. The full flowrate from the radiator under HOT conditions preferably should occupy eighty or ninety percent of the circumference of the intake to the pump impeller; and should occupy at least about sixty percent of the circumference, as a minimum.

[0051] The open interior conduit 258 of the slider 257 has a radially-outwards-facing opening 259. This opening 259 connects with the radiator-port 256 when the slider 257 is to the right. Coolant enters the pumping-chamber 254 from the radiator, and passes to the pump impeller 260. The radiator-port 256 is blocked when the coolant is cold (upper-half of Fig 9) and open when the coolant has warmed up (lower-half of [~~Fig 9~~] Fig 9).

[0057] Inside the pump chamber 254 is a thermostat unit 275. The unit 275 is conventional, in itself, and includes a bulb which expands as it heats, driving a stem 276 out of the thermostat casing 278. The casing is a press fit inside the slider 257. [~~(Again,~~] Again, it will be understood that a thermally-controlled movement-actuator other than a traditional wax-type thermostat may be provided, e.g an electrical linear actuator coupled to a thermal sensor, for the purpose of moving the [~~slider.)~~] slider.